

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 28

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte STANLEY CANTER

Appeal No. 1998-2460
Application No. 08/654,763

ON BRIEF

Before KRASS, BARRETT, and BARRY, Administrative Patent Judges.

KRASS, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the final rejection of claims 1-4, 6 and 8-10, all of the pending claims.

The invention is directed to a battery charger power regulator that operates from a solar array and uses a Peak Power Tracker (PPT). Unlike the prior art, which tracked and determined the peak power point of the solar array, the invention seeks to maximize the charge current of the battery and not to operate at a particular point on the power curve of the solar array. In particular, a PPT control loop is utilized. This control loop employs an oscillator which, in combination with other elements, causes an increase in the duty cycle of a pulse width modulated buck regulator by incrementally increasing the potential across a capacitor that has no discharge path. The total output current from the buck regulator is sensed and a decrease in current causes a reduction in the duty cycle while the decreased duty cycle, in turn, results in a sensed increase in total current. Thus, the circuit will eventually oscillate about a maximum battery charging current value that corresponds to the peak power point of the solar array, analogous to the functioning of a PPT.

Representative independent claim 1 is reproduced as follows:

1. A method for operating a pulse width modulated switching power converter having an input coupled to an output of a solar array and an output providing an output current, the output current being coupled to a battery for supplying a current I_{CHARGE} to the battery and also coupled to a load for supplying a load current I_{LOAD} , comprising the steps of:

sensing a first magnitude of the output current, the output current comprising both I_{CHARGE} and I_{LOAD} ;

storing the sensed magnitude;

incrementally increasing a duty cycle of the pulse width modulated switching power converter to attempt to incrementally increase a magnitude of the output current of the switching power converter;

sensing a second magnitude of the output current; and

comparing the stored first magnitude to the sensed second magnitude;

if the stored first magnitude is less than the sensed second magnitude, maintaining the duty cycle at a current duty cycle increment, else

if the stored first magnitude is greater than the sensed second magnitude, decreasing the duty cycle;

wherein the method does not directly sense the output of the solar array while operating to maximize the charging current to the battery, and wherein the duty cycle of the pulse width modulated switching power converter is controlled only in accordance with the sensed output current.

Appeal No. 1998-2460
Application No. 08/654,763

The examiner relies on the following references:

Rogers	4,314,198	Feb. 02, 1982
Chetty	4,604,567	Aug. 05, 1986
Black et al. (Black)	4,731,870	Mar. 15, 1988
Bavaro et al. (Bavaro)	4,794,272	Dec. 27, 1988
Frederick et al. (Frederick)	5,327,071	Jul. 05, 1994

Claims 1-4, 6 and 8-10 stand rejected under 35 U.S.C.

103. As evidence of obviousness, the examiner cites Bavaro, Chetty, Rogers and Frederick with regard to claims 1-4 and 6, adding Black to the combination with regard to claims 8-10.

Reference is made to the briefs and answer for the respective positions of appellant and the examiner.

OPINION

We reverse.

Appeal No. 1998-2460
Application No. 08/654,763

The examiner employs Chetty for the teaching of a sample and hold circuit. Rogers is employed for the teaching of not sensing the output of the solar array; Frederick is employed for its teaching of providing "the sensing of the output current delivered to load that is used as a signal sent to a pulse width modulator to control the switching power converter" [answer-page 5] and Black is employed for its teaching of a low earth orbit satellite that employs a solar array.

However, it is the primary reference to Bavaro on which the examiner relies for a disclosure of much of the subject matter of the independent claims. Each of the independent claims requires, inter alia, the sensing of both the current to the battery **and** the load current in operating the claimed pulse width modulated switching power converter. Since none of the other references is alleged by the examiner to disclose or suggest the sensing of **both** the battery current **and** the load current, this claimed feature must be disclosed or suggested by Bavaro if the rejection is to succeed.

However, reference to Figures 3 and 4, and column 5, lines 47-49 indicates that, in Bavaro, the operating point adjustments and load regulation is a "function of readings from **only** the battery current sensor" [emphasis ours]. Thus, Bavaro specifically teaches that both the battery current and the load are **not** employed in operating the pulse width modulated regulator. We note that column 5, lines 52-53, recites that "Battery current was chosen for simplicity" which might leave open the possibility that other current measures could be employed. However, such a suggestion is still a few steps away from suggesting that perhaps **both** battery current and load current should be sensed. As far as we can tell from the record, including the examiner's allegations, the only suggestion for sensing **both** the battery current and the load current comes from appellant's disclosure alone.

Even in the rationale explaining the rejection, at page 4 of the answer, the examiner states that Bavaro discloses "...the sensing of the output current delivered to load that is used as a signal sent to a pulse width modulator to control the switching power converter..." However, the examiner does

not appear to be alleging that **both** the battery current and the load current are to be used by Bavaro to control the power converter. Moreover, while the examiner alleges that output current "delivered to load" is used to control the power converter, the examiner never indicates any particular section of Bavaro that suggests this sensing of load current.

In response to appellant's argument on this point, the examiner responds with what he believes to be the "crux" of appellant's invention. Analyses under 35 U.S.C. 103 must be made with regard to the claimed subject matter which recites what an applicant regards as his invention and may not be made on a general concept or "crux of the invention" criteria.

Further, the examiner explains, at pages 7-8 of the answer, that Bavaro teaches an output current measuring means "within the different embodiments that measure the two different components of the output current, the load current and the battery current." However, the examiner fails to specifically point to the portion of Bavaro on which he relies for the conclusion that both the battery current and the load current are measured. Both Figures 3 and 4 of Bavaro, show a sensor 355 V/T only at the battery and a battery current

sensor I_{bc} but we find absolutely no suggestion in Bavaro that more than the battery current is sensed for determining the operating point. It also does not appear that any of the other applied references can cure this deficiency of Bavaro, except, possibly, Frederick. Frederick does disclose a control signal derived from a current sensor which senses the output current which comprises a battery current and a load current (See Figure 2 of Frederick). However, independent claim 1 requires that the duty cycle of the pulse width modulated switching power converter is controlled **only** in accordance with the sensed output current. Frederick's duty cycle is controlled in accordance with the control signal 36 **and** the output voltage of the solar array. Since there is no suggestion of doing away with the solar array output voltage as a controlling factor, Frederick does not appear to aid in providing for the deficiency of the other references regarding the subject matter of instant claim 1. Thus, we will not sustain the rejection of independent claim 1 under 35 U.S.C. 103.

Appeal No. 1998-2460
Application No. 08/654,763

With regard to independent claim 3, appellant argues [page 15-principal brief] that this claim distinguishes over the applied references by its recitation of the means for controlling the duty cycle in accordance with the sensed current having an input coupled to an output of the current sensing means and to an output of said means for incrementally increasing. Since the examiner has not addressed the limitation of the means for "incrementally increasing a duty cycle...", and we are unaware of any reason to modify the applied references to provide for this claimed recitation, we will not sustain the rejection of claim 3 under 35 U.S.C. 103.

With regard to independent claim 6, appellant argues [principal brief-page 15] that the distinguishing feature is the recitation of a combination of a capacitance and an oscillator for providing a signal for periodically applying a charge to the capacitance. Since this is the means by which a corresponding increase in the duty cycle is produced and we have held that the recitation of the "incrementally increasing" limitation distinguished over the applied

Appeal No. 1998-2460
Application No. 08/654,763

references with regard to claim 3, we will also not sustain the rejection of claim 6 under 35 U.S.C. 103.

The final independent claim, claim 8, recites subject matter similar to the other claims but includes the limitation that the solar array is part of an "earth satellite." The examiner relies on the additional reference to Black for the teaching of employing solar cells in an earth satellite. However, Black does not provide for the deficiencies of the other references, noted supra, relative to the current sensor coupled **only** to an output of the switching device and **not** to an output of the solar array.

Accordingly, the examiner's decision rejecting claims 1-4, 6 and 8-10 under 35 U.S.C. 103 is reversed.

REVERSED

Appeal No. 1998-2460
Application No. 08/654,763

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Administrative Patent Judge)	
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